A STUDY OF THE COMPETITIVE SITUATION ON BUREAU OF LAND MANAGEMENT TIMBER SALES IN THE DOUGLAS FIR REGION OF OREGON

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SUMMARY OF FINDINGS FROM THE STUDY AND ANALYSIS OF THE COMPETITIVE SITUATION FOR BUREAU OF LAND MANAGEMENT TIMBER SALES

The competition for timber managed by the Bureau of Land Management over the past five years has been intense. Yet at the same time, about 20 percent of the timber volume offered has sold at or near the appraised price. This raises the following questions for which the study seeks answers: Are policies and procedures in any way responsible for this seemingly contradictory situation? Have firms somehow been discouraged from competing for this timber?

GENERAL COMMENTS

The bibliography lists six studies which probe into questions of competition for Federal timber sales. This study takes into account pertinent findings of those studies. It also includes an analysis of BLM sales data for the calendar year period 1962 through 1966. From this data, multiple-regression analysis has been used to identify factors associated with the degree of competition, as indicated by the ratio of bid price to appraised price, and discriminate function analysis to predict the class of competition by bid categories, one-bid or multi-bid.

Findings from the review of past studies and from statistical analysis in this study, indicate that factors associated with the degree and class of competition for BLM timber in western Oregon are both numerous and diverse. They vary significantly in kind, direction and magnitude between geographic areas. This finding is substantiated by the studies of Walter J. Mead and the 1963 BLM analysis.

SIGNIFICANT FACTORS BY GROUPS

As in past studies, the number of qualified and active bidders for a given sale was found to be an overpowering influence on both degree and class of competition experienced. Since number of bidders may often be the result of other underlying factors rather than a basic influence in and of itself, its effect was isolated in part of the analysis in this study. Other factors were then found to show statistically significant influence when removed from the shadow of number of bidders. These factors fall into four basic groups: firm characteristics; market conditions; noncontrollable timber sale elements; and controllable timber sale elements.

Firm Characteristics

Evidence was lacking that large, diversified firms were exercising market power in procuring BLM managed timber. This does not mean that this condition did not exist, but the data and variables used in the study do not indicate that it did. As observed by Mead, the competition for BLM managed timber seems to be equally intense among firms of all sizes.

Some evidence was found that a higher level of vertical integration and a lower level of dependency on Federal timber supply are associated with a lesser degree of competition in a few areas, but it does not follow that this would be true on a regional basis.

Large firm sizes, vertical integration and dependency were not found

to be important to the class of competition (one-bid or multi-bid).

Market Conditions

The condition of the national market for wood products is a factor which proved to be important to both the degree and class of competition within individual forest management areas. As expected, stronger markets were associated with more bidders and higher bid prices.

Also, demand versus supply ratio, as expressed by relationship of mill capacity to timber supply in a local area, was found to be positively related to the degree of timber sale competition experienced.

Noncontrollable Timber Sale Elements

Several factors related to individual timber sale conditions that lie largely beyond administrative control were found to have significance in timber sale competition. The relative soundness of timber as indicated by volume recovery was found to be positively related to the degree of competition, i.e., sounder, higher recovery timber received a greater degree of competition. Similarly, higher quality timber as indicated by its potential end product grade recovery, was found to receive more intensive competition; however, little influence of this factor was found in differentiating between the classes of competition for timber sales. As expected, both the degree of competition and the probability of a multi-bid sale decreased with increases in logging difficulty.

Controllable Timber Sale Elements

Several factors related to timber sale characteristics which are to some degree administratively controllable were found to have significance in timber sale competition. This analysis showed that the size of timber sale was significantly related to the degree of competition in several areas. While studies by Walter J. Mead and Franklin Y. H. Ho indicated a negative correlation between sale size and degree of competition, this study showed variable relationships which were positive for some areas, negative for some areas and were positive and negative on a curvilinear basis for other areas. (See Figure 1.) Sale size was not found to be related to class of competition.

Time of year for a sale offering was found to have significance. In general, the later a sale was made in the calendar year, the lower the degree of competition and the greater the probability of a one-bid situation. The length of the contract was also found to be important to both the degree and class of competition with longer term sales receiving greater competition and lessened probability on one-bid occurrence.

Road use costs were related to the class of competition for about 20 percent of the areas studied. In those cases, a higher cost was associated with an increasing probability of a one-bid sale. The cost of road construction proved to be significant in both degree and class of competition in 5 of the 23 areas studied. In three of these cases, the relationship was the same as observed by Mead

and Ho, namely, an increase in cost was associated with decreased competition. In the other two areas, the converse was indicated.

CONCLUSIONS REACHED FROM THE STUDY AND ANALYSIS OF THE COMPETITIVE SITUATION FOR BUREAU OF LAND MANAGEMENT TIMBER SALES

IMPLICATIONS FOR FURTHER ACTION

Improvement in timber sale policies and procedures should be directed toward removing obstacles to competition in accordance with statutory objectives. However, wide ranges in diversity of many factors limit options for policy change. Controllable factors which analysis shows arerelated to limited competition should be improved to the extent possible.

CONCLUSIONS ON CONDITIONS AFFECTING COMPETITION

This study and analysis as well as those made in the past, indicate that it is not possible to isolate from among the myriad of variables associated with competition, significant and important variables which could administratively be manipulated by policy or procedural changes. Influencing factors were found to be diverse and they varied significantly in kind, direction and magnitude between geographic areas. This diversity pertained to both the degree and class of competition.

From the study and analysis of the many factors associated with competition, it can be concluded there are market conditions and physical characteristics of the resource and its environment which are beyond the influence of policy and procedure. Further, it is difficult to estimate how any specific condition modification will affect the general competitive pattern.

The study and analysis did identify that certain adjustments could be made to improve the competitive situation for local, specific geographic areas. These are identified and discussed in the section on recommendations which follows.

RECOMMENDATIONS FOR CONSIDERATION AS A RESULT
OF THE STUDY AND ANALYSIS OF THE COMPETITIVE SITUATION
FOR BUREAU OF LAND MANAGEMENT TIMBER SALES

1. Public information procedures should be strengthened to make sure that all potential bidders over wide areas receive appropriate information on the timber sale program.

2. The annual timber sale plan should be re-evaluated to assure that there is a reasonable distribution of timber sale offerings throughout the 12 month period. Seasonal operating opportunities should be taken into account in scheduling sales. Specifically, summer logging shows should be offered early in the spring whereas all season logging chances may be fitted in at any time during the 12 month period.

3. The length or period of sales contracts needs to be reviewed. Contracts should be of sufficient length to permit reasonable opportunities for logging, but short enough to prevent speculation or unreasonable inventory accumulation.

4. Emphasis should continue to be placed on advanced road construction and expanding marketing opportunities through road system linkage insofar as this is possible and practicable.

5. A reassessment of contractual requirements is needed to assure that resulting logging costs are limited to those associated with sound management practices in timber harvesting. Specifically, the requirements for road construction, harvesting, slash disposal, road use and maintenance should be adequate to meet resource management

objectives, but should not go beyond such objectives.

6. Sale sizes by individual geographic areas should be carefully evaluated to assure that any barriers related to volume and the local competitive situation are overcome to the extent possible.

A STUDY OF THE COMPETITIVE SITUATION ON BUREAU OF LAND MANAGEMENT TIMBER SALES IN THE DOUGLAS FIR REGION OF OREGON

I. INTRODUCTION

A. PURPOSE

It is the purpose of this study to determine the significant factors related to competition for public timber offerings, principally those related to one-bid sales or sales receiving only token bids.[1/] Further, an attempt will be made to determine if any of these factors are in some degree controllable by the administering agency.

B. BACKGROUND

Approximately four and one-half billion board feet of public timber is sold annually from national forests and forest lands administered by the Bureau of Land Management in the Douglas fir region of Oregon. This represents about 40 percent of the total timber harvest. The great majority of this timber is sold by oral public auction, and competition for it during the past five years has been generally intense with bid prices commonly exceeding appraised prices by 60 percent or more. Yet a significant amount of the volume offered, approximately 20 percent in the case of the BLM, has sold at the appraised price or received only token bidding.

1/ Token bids are defined as an upbid of less than one percent above appraised price or less than ten cents per MBF on an all species basis, whichever is greater. The BLM has had few sales in this category.

This one-bid/token bid situation has varied widely by geographic areas and over time. Numerous causes have been pointed to as an explanation for its existence, but none has been isolated conclusively and measured as to its effect on this situation.

C. SCOPE

The initial phase of this study is a review of pertinent literature with emphasis on the work of Walter J. Mead. Professor Mead has spent considerable time and effort studying the timber industry in the Douglas fir region and his work could shed light on the problem.

The second phase of the study consists of an analysis of BLM timber sale data from 1962 through 1966. All one-bid/token-bid sales are examined along with a sample of an equal number of multi-bid sales. In all, 1555 sales are reviewed. Appendix I contains a listing of the variables collected on each sale.

Multi-variate analysis is used to identify significant variables. Both multiple regression and discriminate function methods of analysis are employed. A more detailed description of these methods will follow.

II. REVIEW OF PERTINENT LITERATURE

While much about timber sale competition is unknown, it is not the result of a complete lack of probing in the area. There have been several studies of substance that deal with competition in the Douglas fir forest industry. The following section is a summary of the pertinent information from these studies.

A. "SMALL LUMBER COMPANIES IN WESTERN OREGON" BY FRANKLIN Y.H. HO (April 1963)

Mr. Ho was hired by the Small Business Administration to study the cause for the rapid decline of small firms in the lumber industry in western Oregon. His approach to the study was basically the use of questionnaires. Questionnaire data were classified by mill size and the results tabulated and analyzed. The classification used in Mr. Ho's study was as follows: Class A, 120 MBF capacity per day or more; Class B, 80 to 120 MBF per day; Class C, 40 to 80 MBF per day; Class D less than 40 MBF per day.

He found that even though small operators were continually confronted by serious log shortage problems, they seemed to show a lack of interest in public timber sales. Table 1 taken directly from Ho's study, vividly illustrates this situation.

Notice that about one-sixth of the companies in Class B, about one-third in Class C, and over two-thirds in Class D did not submit bids on Federal timber sales. Ho concludes from this that "certain formidable barriers must prevent small companies from making attempts at

bidding." One barrier may simply be a lack of good information on Federal timber sales. Ho's study revealed that, of the operators in Class D, only 43 percent had any official information on Federal timber sales.

TABLE 1

COMPANIES INTERESTED IN AND BIDDING ON FEDERAL TIMBER SALES

Class	Are you interested in Federal timber sales?		Do you bid at Federal timber sales?	
	No	Yes	No	Yes
A	0	13	0	13
B	1	27	5	23
C	5	26	11	20
D	42	47	69	22

Other barriers may involve Federal policies. The single most important factor that prevented companies in Class D from bidding was the large size of the sale. In contrast, almost no company indicated that sales were too small to prevent bidding.

The second most important factor preventing companies in Class D from bidding was "high price." Some companies in all classes had this complaint.

Finally, financial problems were listed as the third most important factor in preventing small firms from bidding. Also, many small firms listed access road requirements as a negative factor.

Ho asked lumber mill owners to make suggestions for improvement in

Federal timber sale policies. The ranking by importance of the various suggestions was different for the different size classes of operators. The following, in order of importance, are the suggestions of smaller operators:

1. Timber Sales in Smaller Units. Almost 70 percent of the operators in Class D favored smaller sale sizes. Ho feels sales within the range of 1 million board feet to 9.9 million board feet are "reasonable." The great majority of BLM sales fall within this range. Ho feels that more sales within this range would "strengthen the growth of competition in the industry."

2. Access Road Requirements Moderated. This recommendation was received from operators in all classes. As mentioned earlier, this is one of the major factors preventing the small firm from bidding. Twenty companies recommended that the Federal government build more roads. Ho feels that "there seems to be great merit to this suggestion."

3. Relax Financial Requirements. This suggestion was particularly aimed at the reduction in bonding requirements. It was received from operators in all size classes.

4. More Sealed Bid Sales. Smaller companies "greatly favored" sealed bids over oral bids.

B. "ANALYSIS OF TIMBER SALE BIDDING" - A BLM STUDY

In 1963, BLM's Oregon State Office made a study to determine what relationship, if any, existed between timber sale bidding and other variables such as logging costs, sale volume species mix, pond value, number of bidders, etc. Data for this analysis were taken from BLM timber sales of March 1961 through April 1962. Multiple regression technique was used to analyze data. For each district, data were processed separately; then the data were combined and run for all of western Oregon. Both the high bids of all bidders and the high bid of the successful bidder were analyzed. The following summary is mainly concerned with the all-bidders analysis:

1. Only a small percentage of the variation in bidding was covered by the independent variables chosen for this study. There were, however, several variables that were significant at high levels.

2. Perhaps the most interesting result of this study was the indication that bidding in each district is influenced by conditions as a whole which differ from those of any other district; i.e., different variables proved significant in each district.

3. Where sale volume was a significant variable, the bidding tended to decrease as the sale size increased. This supports Ho's findings. Road costs, however, show

just the opposite effect; i.e., as road cost allowances increased, the bidding increased.

4. On a western Oregon basis, the most significant variable was number of bidders. Bidding increased as the number of bidders increased.

It was apparent from the small amount of variation in bidding covered by the nine independent variables in this study that many other factors influence bidding. The 28 variables tested in the current study are an attempt to explain more of this variation.

C. "COMPETITION AND OLIGOPSONY IN THE DOUGLAS FIR LUMBER INDUSTRY" by WALTER J. MEAD

Dr. Mead is a professor of Economics, University of California, Santa Barbara. This book was primarily written for professional economists to add insight to the relationships between the structure of an industry, its market conduct and resulting performance.

The effective market area for timber is narrowly circumscribed; approximately 92 percent of the timber sold from national forests in the Douglas fir region is processed within 75 miles of its source. Mead points out this condition is associated with an inelastic supply function for timber; i.e., a change in the quantity of timber used by a firm will have a marked influence on the price of timber in a specific area. This leads to a strong interdependence among firms; thus, the market for timber is oligopsonistic.

This oligopsonistic structure leads to both implicit and explicit collusion among Federal timber sale bidders. Based on economic theory, one might hypothesize that this situation would exist. He found that the "only meaningful entry barrier" in the lumber industry was timber supply.

From interviews conducted with people from the industry, Mead found that bidders were required to develop a bidding strategy to obtain their timber supply. Established firms within an area were extremely jealous of the Federal timber supply in "their" area. Bidding strategy, such as preclusive bidding, is used to discourage the "outsider" who attempts to bid in the area. Also, an outsider may be discouraged from purchasing timber in an area by the established firms agreeing not to buy logs from him.

When Mead examined bid-appraised price ratios for individual national forest timber sales, he found that the ratio varied directly with the number of bidders and inversely with operator size and sale size. This relationship of bid ratio to number of bidders and sale size tends to substantiate the results of the BLM study. It also lends support to Ho's contention that a reduction of sale size would bring increased competition. Mead feels that the inverse relationship between the bid ratio and firm size is an indication of the market power of larger firms.

Mead also analyzed the market performance for national forest timber on a geographic basis. He found, as did BLM, that competitive

conditions varied widely between geographic areas. Mead's data indicated that the reason for this diversity in competition was basically attributable to two factors: 1) the number of qualified bidders withing a geographic area, and 2) the percent of total volume purchased by large firms. Competition was found to vary directly with the first factor and inversely with the second. Thus, we have another indication of market power of large firms.

Mead feels that the market power of the large firms can be attributed to both direct and indirect forces. Direct forces include barriers to entry into the auction market and the ownership of substantial timber reserves. Capital requirements that are caused by large sale size and heavy road building requirements are seen as the major barriers to entry. Again, this tends to substantiate Ho's findings. The ownership of timber reserves allows the large firm to be selective in the Federal sales purchased.

The major indirect force explaining large firm market power, Mead calls "bidder futility." Developed from extensive interviews, this phrase refers to the feeling of futility among some potential buyers who avoid a confrontation with their larger rivals. The concept of "bidder futility" may help to explain Ho's observation that a large percentage of small firms do not bid on Federal sales. Mead attributes "bidder futility" to four major factors:

1. Many large, established firms have superior location in relation to their smaller rivals.

2. The ownership of private logging roads on private land adjacent to Federal land may serve to lower substantially log transportation costs.

3. Large firms generally have superior economic power resulting from the ownership of timber reserves, a secure financial situation, and a diverse and more stable income.

4. Large firms receive a better tax break through capital gains on timber ownership.

As an alternative to present Federal timber sale policies, Mead feels that "The observed market power of large firms and other inequities resulting from the large gap between competitive and non-competitive sales, would be eliminated or reduced if Federal timber were sold in wholesale log markets rather than as standing timber."

D. "COMPETITION FOR FEDERAL TIMBER IN THE PACIFIC NORTHWEST" (Draft August 1967) WALTER J. MEAD AND T.E. HAMILTON

This paper is an indepth look at competition for Forest Service and BLM timber. Apparently much of this material served as background for the previous book as many of the findings and conclusions are identical. There are some significant observations of differences in results of BLM and Forest Service sales that warrant attention.

The authors found that "unlike the evidence in our examination of Forest Service sales, competition between large firms appears to be just as intense as small firm competition for BLM sales." While

this observation may be true for the size classification used by Mead and Hamilton, different results may be achieved with different classification. This hypothesis is tested by the study.

While the authors found that sale size "appeared" to be a financial barrier to entry on BLM sales, their evidence seems to be a bit weak. Sale size did not enter as a significant factor in the regression analysis.

When analysing competition on a geographical basis - working circles and master units - the authors again found somewhat different results. The Forest Service data (working circles) showed both average number of bidders and size of the buyer to be important factors in competition.

The BLM data showed that only the number of bidders were an important factor. The authors recognize one of the reasons for this difference may be in the size and number of master units. While there were 43 working circles, there were only 12 master units and these covered a much larger and more economically diverse area.

Mead and Hamilton conclude by making several recommendations to "create conditions that encourage competition." Most of these have been discussed before and we will not repeat them here. One, however, is interesting in that it coincides with one of Ho's major recommendations: "..... that in order to reduce an observed barrier to entry into the market for Federal timber, all main line logging roads be constructed into each given sale area prior to its sale."

E. SUMMARY

First, to emphasize that with the exception of the BLM analysis, the foregoing comments and conclusions are not necessarily those of the BLM. They are given to help set the stage for the analysis that follows. There were some apparent consistencies and a few inconsistencies between each of the foregoing studies. Table 2 shows the between study relationships of important factors. All of these and several other factors are tested in the study analysis.

TABLE 2

A COMPARISON OF IMPORTANT VARIABLES BETWEEN STUDIES

Variable	Study		
	Ho	Mead	BLM
Sale Size	-	- 3/	-
Number of Bidders		+ 3/	+
Road Costs	-	-	+
Appraised Price	- 2/	- 3/	
Firm Size	-	-	

1/ A "+" indicates a positive relationship between the variable and the level of competition; a "-" indicates a negative relationship; a blank indicates the variable was not tested in the study.

2/ This relationship is implied by Ho's analysis.

3/ This relationship was only observed in Forest Service data.

III. ANALYSIS TECHNIQUES

To accomplish the intended purpose of the study, it is advantageous to examine competition for Federal timber in two ways. First, it is useful to know the factors that are associated with the degree of competition. The numerical figure chosen to represent the degree of competition is the Bid Ratio or the ratio of average bid price of all species to the average appraised price of all species. Second, it is helpful if the factors associated with the competitive class can be isolated. Competitive class is defined as either the one-bid or multi-bid category. The first approach is studied through the use of Multiple Regression; the second by Discriminant Function Analysis.

While in some cases the same inference might be drawn from an analysis of the degree of competition as would be drawn from the class of competition analysis, in other cases an important difference is reflected. A brief examination of one of the variables may help to clarify this point. Suppose an operator is thinking about bidding on a sale with a relatively short contract period. If he is a small operator with little equipment or equipment tied up in another sale, the short contract period may automatically exclude him from bidding; i.e., the contract period becomes a discriminating factor. On the other hand, a second operator may have the equipment to do the job in the allotted time, but the short contract doesn't permit the flexibility that a longer contract period would. He may not be able to take advantage of capital gains or be able to "play the market" under a short contract.

This makes the sale less valuable to him; he bids on it, but he bids less than he would for a sale with a longer time period. Thus, the time allowed for harvest becomes important to the degree of bidding. If the first operator were indicative of the majority of the operators in an area, then contract period might act as a discriminating factor; a barrier to competition. If, however, the majority of operators were like the second operator, then only the degree of competition would be affected.

This section of the report contains a brief description of the application of Multiple Regression and Discriminant Function Analysis to this study. A more thorough explanation can be found in Appendix III.

A. MULTIPLE REGRESSION

Multiple regression is a statistical technique that enables the analyst to measure the relationship between a factor or group of factors (independent variables) and a factor of prime interest (dependent variables). The result of the analysis is an equation showing the functional relationship, if any, between the independent variables and dependent variable with statements of statistical significance. A warning: Regression analysis does not prove a cause and effect relationship. For example, just because sale size is negatively correlated with the bid ratio, it cannot be said that an increase in sale size causes a decrease in the bid ratio. It may be inferred, but the regression indicates only a relationship between the two.

The dependent variable for this study is the "Bid Ratio." Twenty-five independent variables are selected for testing. These variables, along with the rationale for their selection are shown in Appendix I. Separate regression runs were made for data within Forest Management Areas [1] and between Forest Management Areas. See Appendix III for a more thorough explanation.

1. Within Forest Management Areas

The basic unit of analysis for this study was the Forest Management Area. This unit holds no particular significance to this study other than being the smallest area for which data could be separately identified. A separate regression run was made for each Forest Management Area. The objective of the Forest Management Area breakdown was to test the findings of Mead and the previous BLM study that indicated a wide variation on competitive conditions between geographical regions.

2. Between Forest Management Areas

To account for the variation in competition between Forest Management Areas, a regression was run using the mean "Bid Ratio" for each Forest Management Area as the dependent variable and the means of the other variables by Forest Management Area as the independent variables. These data are listed in Appendix II.

1/ Forest Management Areas are geographic subdivisions used by BLM for administrative purposes. There are 23 Forest Management Areas in the area studied; all were used in this analysis.

B. DISCRIMINANT FUNCTION ANALYSIS

The objective of the analysis is to identify those factors which are effective in distinguishing between one-bid and multi-bid sales. In the analysis a function of the factors was developed to best discriminate between the two classes of competition, i.e., one-bid and multi-bid. In order to best discriminate, the differences in the discriminating function were relatively great between classes where the differences within the classes were relatively small.

IV. DATA COLLECTION

The data for these analysis were taken from BLM sales 1962 through 1966. All single-bid and token-bid sales from this period were used and approximately an equal number (district basis) of multi-bid sales were systematically sampled. Total number of sales in the sample was 1555. This represents approximately 62 percent (by number) of BLM advertised sales for the 1962-1966 period. Because of the nature of the sampling procedure, the districts having the greater number of one-bid and token-bid sales were sampled heaviest for multi-bid sales. Table 3 lists the number of sales taken in each district.

TABLE 3

NUMBER OF SAMPLE SALES BY DISTRICT AND COMPETITIVE CLASS

District	One-bid/ Token-bid	Multi-bid	Total
Salem	140	138	278
Eugene	111	127	238
Roseburg	192	168	360
Coos Bay	99	122	221
Medford	255	203	458
Total	797	758	1555

Appendix I provides an explanation of the data collected. Appendix II contains the number of sales sampled by Forest Management Area.

V. RESULTS OF THE ANALYSIS

A. REGRESSION ANALYSIS

As previously stated, the purpose of the regression analysis is to isolate those factors which are associated with the degree of competition for BLM timber sales - the measure of the degree of competition being the "Bid Ratio." The results of the analysis will be examined in two parts: Competition within Forest Management Areas and competition between Forest Management Areas.

1. Competition Within Forest Management Areas

The degree of competition for BLM sales within Forest Management Areas varies considerably. Not only is it desirable to find the factors associated with this variation, but also to see if some factors show significance in a number of other Forest Management Areas. If not and if many different factors appear significant in other Forest Management Areas, then a single policy aimed at increasing competition on a statewide basis may run into considerable difficulty.

Two separate regression runs were made for each Forest Management Area. One allowed all variables listed in Appendix I to enter if they met a minimum level of significance. (See Table 4.) The other did not consider the "Number of Active Bidders" and the "Number of Qualifiers" variables.

It is obvious from a glance at Table 4 that "Active Bidders" and "Qualifiers" are by far the most consistently significant variables.

All but one Forest Management Area had one of these two as the most important variable. This observation is substantiated by the work of Mead. Also of interest is the fact that every one of the variables used in the study had some correlation in at least one Forest Management Area. But only eight of the variables had significance in four or more Forest Management Areas. In other words, here is evidence that factors associated with competition for BLM timber vary greatly in their importance and intensity between geographical areas. Table 5 is a summary of the results shown in Table 4.

Notice that most of the variables had the sign that would logically be expected. However, there are some notable exceptions. "Housing Starts," for example, was significant in six Forest Management Areas, and in five of these it had a negative correlation. This can probably be explained by the cycle nature of housing starts and the time lag involved in industry response. In other words, as housing starts are on a rising trend, the industry, because of lag, may still be responding to a low period. Time did not permit investigation of this point. Another notable example is "Percent Recovery." In three of four Forest Management Areas this variable had negative correlation.

It should be mentioned that the "Capacity Ratio" and "Potential Bidders" variables are not very meaningful to the "Within Forest Management Area" analysis. This is due to the broad averages used for these variables. "Capacity Ratio," for example, was computed on a county basis.

VARIABLE CORRELATION BY FOREST MANAGEMENT AREAS (ALL VARIABLES ALLOWED TO ENTER)

District	Forest Management Area	1 Operator Type	2 Dependency Status	3 Active Bidders	4 Qualifiers	5 Potential Bidders	6 Dist. to App. Pt.	7 Distance to Mill	8 Market Diversity	9 Operator Size	10 Capacity Ratio	11 Market Level	12 Unmiller Shares	13 Month	14 Sale Volume	15 Salvage Volume	16 Species Comp. %	17 % Recovery	18 Pond Value	19 Road Costs	20 Slope to Truck Cost	21 Road Use Cost	22 Contract Period	23 $(X_{19})^2$	24 $(X_{20})^2$	25 X_{19}/X_{20}	26 $(X_{14})^2$	27 Stumpage Price	R^2
Salem	Columbia			⊕	±							±		=				=											.64
	Molalla			±	⊕																								.60
	Alsea			⊕	±								—																.64
	Blackwell	—		⊕			±		±			±	=			±														.80
	Trabaree			⊕														±				±		=					.77
	North Santiam	±	±		±	=									(=)	+		=											.98
Medford	Galice			⊕	±												—												.60
	Glendale			⊕	±		±							=	=								±		±		+		.79
	Applegate			⊕																							=		.62
	Grail			⊕																=									.58
	Greensprings			⊕									±		=										±				.62
Roseburg	Drain			⊕	±			±	—								±												.60
	Dillard		=	⊕		±			=																				.70
	North Umpqua			⊕	±	—		±						—				=			±				±	=			.71
	South Umpqua		±	⊕	±																								.73
Eugene	Siuslaw			⊕	±		+			=	—									+									.97
	Triangle Lake			⊕	+			+					—										±						.80
	Mohawk				⊕	=					—						±		+	+									.78
	Willamette-McKenzie			±	⊕					+				—	±									+	±				.68
Coos Bay	Coquille			+	⊕						+	=		—			=											—	.66
	Lower Umpqua			±	⊕								=		=														.65
	Myrtle Point			±	⊕	=			—																			=	.71
	Curry			⊕	=		=	=	=								=			=		±		±					.69

Legend:

± = Positive correlation at or below the 5% significance level 1/.
\+ = Positive correlation, 5% to 10% significance level.
= = Negative correlation at or below the 5% significance level.
\- = Negative correlation, 5% to 10% significance level.
Empty cell = No correlation or correlation did not meet the 10% level of significance.
⊕ = Most significant variable as indicated by the variation accounted for (R^2).

1/ Level of significance indicates the probability of the observed relationship being due to chance. The lower the percentage associated with the significance level the more significant the variable. Because of the nature of the analysis procedure these levels may not be precise. See Appendix III for further explanation.

TABLE 4

A COMPARISON OF ACTUAL VARIABLE CORRELATION WITH HYPOTHESIZED CORRELATION (All Variable Analysis)

TABLE 5

Group	1/	Variable	No. of "+"	No. of "-"	Total Out of 23 Forest Mgmt. Areas	Predominant Sign	2/ Expected Sign
	1	Operator Type	1	0	1	+	+
A	2	Dependency Status	2	2	4	±	+
	10	Operator Size	0	3	3	-	-
	4	Number of Active Bidders	21	0	21	+	+
	5	Number of Qualifiers	16	1	17	+	+
	6	Potential Bidders	0	4	4	-	+
B	9	Market Diversity	4	2	6	+	+
	11	Capacity Ratio	1	0	1	+	+
	12	Market Level	3	1	4	+	+
	13	Housing Starts	1	5	6	-	+
	14	Month of Sale	0	4	4	-	-
	28	(Month of Sale)^2	1	1	2	±	+
	7	Distance to Appraisal Point	3	0	3	+	-
	8	Distance to Mill	1	1	2	±	-
	27	13/14	1	1	2	±	+
	16	% Salvage Volume	2	1	3	+	-
C	17	% Major Species	2	1	3	+	±
	18	% Recovery	1	3	4	-	+
	19	Pond Value	1	2	3	-	+
	21	Stump to Truck Cost	2	1	3	+	-
	24	Stumpage Price	0	2	2	-	-
	22	Road Use Cost	1	1	2	±	-
	15	Sale Volume	0	5	5	-	-
D	26	(Sale Volume)^2	4	2	6	±	±
	23	Contract Period	3	0	3	+	+
	20	Road Cost	1	1	2	±	-

Group A - Firm Characteristics
Group B - Market Conditions
Group C - Noncontrollable Timber Sale Characteristics
Group D - Controllable Timber Sale Characteristics

1/ These numbers are the same as the variable numbers in Table 4.
2/ ± Signs indicate undeterminate.

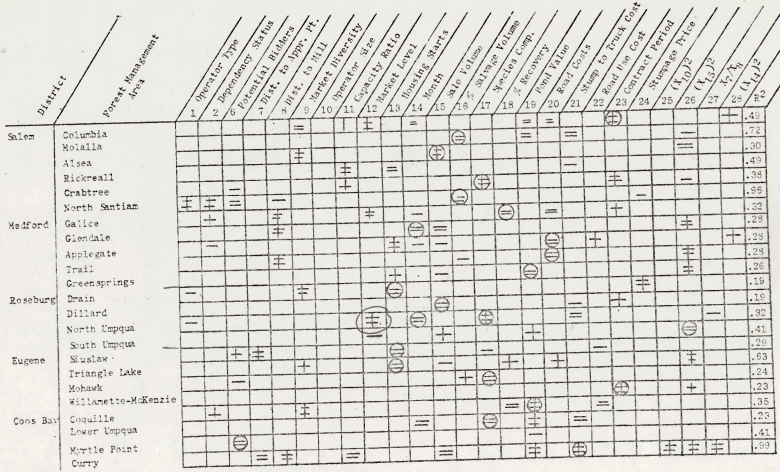
While interesting, the all-variable analysis still does not provide the basic information necessary to answer the questions raised by this investigation. The "Active Bidders" and "Qualifiers" variables account for so much of the variation in the bid ratio that other variables of more interest to this study may not have had a chance to freely enter the analysis. A deletion of these two variables should allow a better look at the situation.

Table 6 is similar to Table 4 except that it reflects the regression results when "Active Bidders" and "Qualifiers" were excluded. Again, one is struck by the difference in importance of variables by Forest Management Areas. Notice that only two times does any variable show as most significant in more than two Forest Management Areas. Again, there is witness to the diversity of conditions with which we are dealing.

Table 7 summarizes the results shown on Table 6. Variables in this table are grouped by the purpose for which they were used in the analysis.

The major purpose for including the variables in Group A was to see if an influence of firm characteristics could be detected. All three characteristics are closely related; i.e., in general, large firms own more timber and are more diversified than smaller firms. The results of this analysis are not too clear. "Operator Type," an index of vertical integration, had a positive correlation in one

VARIABLE CORRELATION BY FOREST MANAGEMENT AREAS (ACTIVE BIDDERS AND QUALIFIERS EXCLUDED)



Legend:

⊥ = Positive correlation at or below the 5% significance level 1/.
\+ = Positive correlation, 5% to 10% significance level.
= = Negative correlation at or below the 5% significance level.
\- = Negative correlation, 5% to 10% significance level.
Empty Cell = No correlation or correlation did not meet the 10% level of significance.
◯ = Most significant variable as indicated by the variation accounted for (R^2).

1/ Level of significance indicates the probability of the observed relationship being due to chance. The lower the percentage associated with the significance level the more significant the variable. Because of the nature of the analysis procedure these levels may not be precise. See Appendix III for further explanation.

TABLE 6

A COMPARISON OF ACTUAL VARIABLE CORRELATION WITH HYPOTHESIZED CORRELATION (Number of Active Bidders and Qualifiers Excluded)

TABLE 7

Group	1/	Variable	No. of "+"	No. of "-"	Tot. No. of Forest Mgmt. Areas	Change From All Variable Analysis	Predominant Sign	2/ Expected Sign
	1	Operator Type	1	2	3	+2	-	+
A	2	Dependency Status	3	1	4	0	+	+
	10	Operator Size	0	0	0	-3		-
	6	Potential Bidders	1	4	5	+1	-	+
	9	Market Diversity	4	1	5	-1	+	+
	11	Capacity Ratio	3	1	4	+3	+	+
B	12	Market Level	3	1	4	0	+	+
	13	Housing Starts	2	4	6	0	-	+
	14	Month of Sale	0	7	7	+3	-	-
	28	(Month of Sale)^2	2	0	2	0	+	+
	7	Distance to Appraisal Point	1	1	2	-1	±	-
	8	Distance to Mill	4	1	5	+3	+	-
	27	11/12	1	1	2	0	±	±
	16	% Salvage Volume	1	3	4	+1	-	-
C	17	% Major Species	2	3	5	+2	-	±
	18	% Recovery	1	2	3	-1	-	+
	19	Pond Value	4	4	8	+5	±	+
	21	Stump to Truck Cost	1	5	6	+3	-	-
	24	Stumpage Price	1	1	2	0	±	-
	22	Road Use Cost	1	2	3	+1	-	-
	15	Sale Volume	2	6	8	+3	-	-
D	26	(Sale Volume)^2	6	4	10	+8	+	±
	23	Contract Period	5	0	5	+2	+	+
	20	Road Costs	1	4	5	+3	-	-

Group A - Firm Characteristics
Group B - Market Conditions
Group C - Noncontrollable Timber Sale Characteristics
Group D - Controllable Timber Sale Characteristics

1/ These numbers are the same as the variable numbers in Table 6.
2/ ± Signs indicate undeterminate.

Forest Management Area and a negative correlation in two Forest Management Areas. One would expect a positive relationship; i.e., an integrated firm could more efficiently utilize timber, and thus afford to pay more. The negative relationship in the two Forest Management Areas may be an indication of market power. These two Forest Management Areas, incidentally, had lower than average bid ratios.

"Dependency Status," the indicator of a firm's dependency on public timber, had three positive and one negative correlations. One would expect a positive relationship; i.e., firms who own a significant supply of timber would be selective in the purchase of public timber.

Notice that "Operator Size" did not have significance in any of these analyses. This coincides with Mead's findings on BLM sales that competition is equally intense by large and small firms. Thus, while there is some evidence of the market power of the integrated, timber-owning firm, it is not conclusive and certainly not indicated on a western Oregon wide basis.

The variables in Group B are factors that reflect market conditions, supply versus demand relationships and time of year. These factors are not directly connected with the sale, and BLM has little or no influence over them.

Again, "Market Diversity" and "Potential Bidders" would not be expected to show up too strongly on the "Within Forest Management Area

Analysis." "Market Level" and "Housing Starts" both come into the analysis much the same as they did in the all variable analysis. The "Month of Sale" variable was significant in seven Forest Management Areas, and in each it had a negative relationship; i.e., bid ratios decline as the calendar year progresses.

The variables in Group C are directly connected to the sale, but are basically inherent characteristics not reasonably subject to significant influence by BLM policy. "Pond Value" or the index of quality, came into the analysis more than any other variable in this group - eight times. However, its relationship to the bid ratio was evenly divided - four positive and four negative. "Stump to Truck Costs" entered in six Forest Management Areas and, as expected, had a negative correlation. "Percent of Major Species" as one might expect, had a mixed influence. Depending on local market conditions and manufacturing facilities, minor species may be a burden or a blessing.

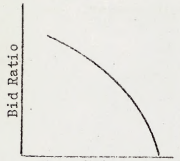
The variables in Group D are factors directly related to the sale and are subject to the reasonable influence of BLM policy. Since these variables are of prime interest in light of the purpose of this study, they will be considered individually.

1. Road Use Costs. These were computed as the road use allowance per MBF plus the allowance for maintenance, both taken from the timber appraisal file. Apparently, this factor, at

least as this study quantified it, was not of particular importance. Only three Forest Management Areas had "Road Use Costs" as a significant variable.

2. Sale Volume and Sale Volume Squared. In one form or the other, and in combination, this variable was significant in twelve Forest Management Areas. It is extremely difficult, however, to determine the overall relationship of this variable to the "Bid Ratio." In four Forest Management Areas the relationship is definitely downward; i.e., an increase in sale size is associated with a decrease in the "Bid Ratio." In two Forest Management Areas the relationship is positive and in the remaining six Forest Management Areas it is mixed. Figure 1 illustrates the difficulty of defining the overall relationship of volume to the "Bid Ratio." Each figure represents a relationship found in the analysis. For example, the relationship in the Alsea Forest Management Area is illustrated by Figure 1b with the maximum "Bid Ratio" being found at a volume of approximately 5700 MBF. Up to that point the "Bid Ratio" is increasing and beyond it the "Bid Ratio" is decreasing. At the same time, the Glendale Forest Management Area (Figure 1d) had a minimum "Bid Ratio" at approximately 4400 MBF. Up to that point the "Bid Ratio" was decreasing and beyond it the "Bid Ratio" increased. "Sale Volume" is apparently an important

SALE VOLUME-BID RATIO RELATIONSHIPS FIGURE 1



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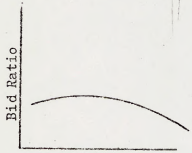
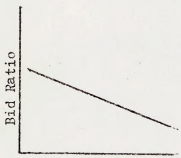


b.



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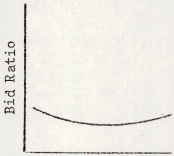

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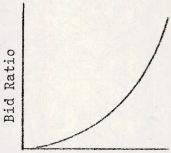


e.

FOREST MANAGEMENT AREAS

				Minimum Points
a.	Molalla		d. Glendale	4.4 MMBF
	Crabtree		Greensprings	2.8 MMBF
	Dillard		Triangle Lake	1.9 MMBF
		Maximum Points	Curry	1.5 MMBF
b.	Alsea	5.7 MMBF		
	South Umpqua	6.6 MMBF	e. Trail	
			Willamette-McKenzie	
c.	Applegate			

factor to the level of competition for BLM timber. Any policy aimed at increasing competition by adjusting "Sale Volume," however, must take these seemingly contradictory relationships into consideration.

3. Contract Period. This variable indicates the length of the sale contract in years. It was significant in five Forest Management Areas and in each had a positive correlation; i.e., an increase in "Contract Period" was associated with an increase in the "Bid Ratio."

4. Road Cost. This variable is the road cost allowance as shown in the timber appraisal and recorded in dollars per MBF. It was significant in five Forest Management Areas; four with a negative correlation and one with a positive correlation. It is interesting to note that the Forest Management Areas that had the negative correlation also had average road costs well above the average for all sales. The Forest Management Area with the positive correlation had one of the lowest average road costs. As in the case of "Sale Volume," one should be particularly careful how the relationship of "Road Costs" to "Bid Ratio" is interpreted. Apparently in some areas the capital and technology for forest road construction are not available in abundance and excessive road construction requirements associated with a timber sale contract may serve as a barrier to entry. In

other areas, however, these resources may be available to the point of surplus and, thus, high road building requirements may actually encourage bidding.

2. Competition Between Forest Management Areas

It is obvious, from even a cursory examination of BLM timber sales results, that there is considerable difference in competition between geographical areas of western Oregon. The "Between Forest Management Areas" analysis is an attempt to explain some of this difference.

It should be kept in mind that the variables used in this analysis are the means of the variables by Forest Management Area that were used in the "Within Forest Management Area" analysis. Thus, there are only 23 observations in this analysis; one for each Forest Management Area.

As in the preceding analysis, the "Active Bidders" and "Qualifiers" variables were first allowed to enter and then eliminated from further analysis. Again, these proved to be important variables when included. However, due to the purpose of this study, they will be excluded from further consideration in this analysis. The following equation proved to be the best when these variables were removed:

$$Y = 1.11704 + 0.13111X_1 + 7.39520X_2 + 0.11115X_3$$

$$R^2 = .53$$

"F" Ratio = 7.234

Where: Y = Mean "Bid Ratio"

X_1 = Mean "Capacity Ratio"

X_2 = Mean "Percent Recovery"

X_3 = Mean of the "Month of Sale Squared"

R^2 refers to the portion of the variation in the "Mean Bid Ratio" accounted for by the equation.

"F" Ratio is a statistical measure of significance.

The variable most important in this analysis, as determined by R^2 added, was the "Capacity Ratio." This is a rough indicator of the supply versus demand relationship and its correlation was just as expected; i.e., a high ratio of mill capacity to saw timber volume was associated with a higher mean "Bid Ratio."

The second variable in importance proved to be the "Percent Recovery" or the ratio of the net sale volume to gross sale volume as determined by the cruise. The correlation for this variable is positive. Forest Management Areas with higher average percent recovery (more defect free timber) had higher "Bid Ratios."

The variable of least importance was the mean "Month of Sale Squared." The reasoning behind its correlation is not very clear. Perhaps it indicates that Forest Management Areas selling the bulk of their sales (by number) in the second half of the year, tend to have higher bid ratios.

It is important to note that none of the variables that appeared in this analysis are controllable to any great extent by BLM policy.

B. DISCRIMINANT FUNCTION ANALYSIS

Table 8 lists the probability of misclassification for each Forest Management Area based upon the discriminant function developed through use of appropriate variables or factors for each Forest Management Area. As might be expected, the discriminating factor as well as the probability of misclassification when used are extremely variable by Forest Management Area. The situation might be characterized generally by saying that we are able to properly classify individual timber sales as one-bid or multi-bid through use of associated characteristics approximately two-thirds of the time in most Forest Management Areas.

In this analysis, there were three variables which did not survive screening in at least one Forest Management Area; these were "Market Level," "Operator Size" and "Operator Type"; the last two of which are closely related. This varies from the regression analysis of degree of competition in which all variables appeared at least once at approximately the same level of significance. A total of 73 variables are used as discriminating factors in the 23 Forest Management Areas while 108 variables contributed to the explanation of degree of competition in all Forest Management Areas. This is not surprising and probably not meaningful since the analyses are for different purposes and the relationships would be somewhat different.

Those variables concerned with Firm Characteristics, Group A, "Operator Size," "Operator Type" and "Dependency Status," over which no control can be exercised by the Federal agencies, were

particularly ineffective for classification of timber sales by competitive interest. Only "Dependency Status" showed up at all and, contrary to what one might expect, that occurred only twice having opposite effects.

The variables, Group B - Table 9, which are related to market conditions have a little greater effect in discriminating between competitive and non-competitive sales than did the firm characteristics. "Market Diversity," "Housing Starts," "Month of Sale" and "Capacity Ratio" were the primary factors in terms of number of appearances in the discriminant function. Each variable had the same effect on the discriminant function each time it survived screening except for "Capacity Ratio" which appeared four times and had equally divided effects. The indication is that the proximity of multi-product facilities (Market Diversity) decreases the number of non-competitive sales. "Housing Starts" indicates more one-bid sales as the number increases. The general indication with regard to the "Month of Sale" is that the number of non-competitive sales decreases in the latter months of the calendar year.

The next group of variables, Group C - Table 9, those which characterize the timber sale in various ways, are again quite variable as to number of entries. The "Percent Recovery" (ratio of net volume to gross volume), the "Stump to Truck Costs," "Distance to Mill" and "Stumpage Price" were those acting as discriminating factors most often. In four out of five appearances, an increased recovery ratio

indicated greater competitive interest. As might be expected, an increase in the number of non-competitive sales was indicated as the logging cost increased. In three out of four cases, an increase in distance from sale to manufacturing plant would increase the competitive interest.1/ An increase in stumpage price, everything else being equal, pointed to an increase in competitive sales in three Forest Management Areas.

The last group of variables, Group C, also describes sale characteristics but contains those which might be controlled by an administering agency.

1. "Sale Volume" appeared five times in one form or another (linear or squared - both in one of the cases). In one case, an increased volume indicated increased competitive interest in the sale and in one case it indicated increased interest for sales roughly over five million board feet, but decreased interest as the sale size increased up to that size. In all other cases, an increase in sale size had the effect of moving the classification toward non-competitive.

2. "Road Use Costs" appeared to be a discriminating factor in five of the Forest Management Areas indicating a decrease in competitive interest as access costs increase.

1/ See Appendix V, page 66 for further comments.

3. "Road Cost" allowance also survived as a discriminating factor five times having the effect in four out of five cases of an increase in the allowance (increasingly difficult and risky requirements) indicating a decrease in competitive interest.

4. The last variable to be considered is "Contract Length" which survived seven times and had the same implication each time, the longer the contract period, the more the competitive interest.

SIGNIFICANT VARIABLES IN THE DISCRIMINANT FUNCTION BY FOREST MANAGEMENT AREA

District	Forest Management Area	1 Operator Type	2 Dependency Status	6 Potential Builders	7 Dist. to Log. Pt.	8 Dist. to Mill	9 Market Diversity	10 Operator Size	11 Capacity Ratio	12 Market Level	13 Housing Starts	14 Month of Sale	15 Volume of Sale	16 % Salvage	17 Species Comp. %	18 % Recovery	19 Pond Value	20 Road Costs	21 Logging Costs	22 Road Use Cost	23 Contract Period	24 Stumpage Price	25 $(\bar{X}_1)^2$	26 $(\bar{X}_2)^2$	27 $\frac{1}{2}\sigma^2_{\bar{X}_1}$	28 $(\bar{X}_1)^2$	29 Probability of a Misclassification
Salem	Columbia										−									+		+	−	−			.28
	Molalla												−						−								.27
	Alsea					+						+				+			−	−	+						.19
	Rickreall			+		+		+		−					+						+						.16
	Crabtree		−		−			+							+						+						.26
	North Santiam															+					+						.04
Medford	Galice																					+		−	−		.23
	Glendale				+						−		+														.31
	Applegate		−									−					−	−					+				.27
	Trail				+			−			−						−										.31
	Greensprings			+													−										.36
Roseburg	Drain									−	−						−		−								.32
	Dillard									−									−	−	+						.28
	North Umpqua																					+	−				.41
	South Umpqua															+				−							.38
Eugene	Siuslaw			+				−			−						+			−	+			−		+	.24
	Triangle Lake									−	−					+											.20
	Mohawk					+																					.39
	Willamette-McKenzie																		−		+						.32
Coos Bay	Coquille		+				+									−						+					.28
	Lower Umpqua																		−								.44
	Myrtle Point	NO SIGNIFICANT FUNCTION																									--
	Curry					+											+									−	.005

Legend:

\+ = Positive correlation at or below the 10% significance level 1/.

\- = Negative correlation at or below the 10% significance level.

Empty Cell = No correlation or correlation did not meet the 10% level of significance.

1/ Level of significance indicates the probability of the observed relationship due to chance. The lower the percentage associated with the significance level the more significant the variable. Because of the nature of the analysis procedure, these levels may not be precise. See Appendix III for further explanation.

TABLE 8

SUMMARY OF SIGNIFICANT VARIABLES IN THE DISCRIMINANT FUNCTION

TABLE 9

Group	1/	Variable	No. of "+"	No. of "-"	Total Out of 23 Forest Mgmt. Areas
A	1	Operator Type	0	0	0
	2	Dependency Status	1	1	2
	10	Operator Size	0	0	0
B	6	Potential Bidders	1	1	2
	9	Market Diversity	4	0	4
	11	Capacity Ratio	2	2	4
	12	Market Level	0	0	0
	13	Housing Starts	0	4	4
	14	Month of Sale	0	6	6
	29	(Month of Sale)^2	0	1	1
C	7	Distance to Appraisal Point	2	0	2
	8	Distance to Mill	3	1	4
	28	11/12	0	2	2
	16	% Salvage	1	1	2
	17	% Major Species	2	0	2
	18	% Recovery	4	1	5
	19	Pond Value	1	0	1
	21	Stump to Truck Cost	0	6	6
	24	Stumpage Price	3	0	3
D	22	Road Use Cost	0	5	5
	15	Sale Volume	1	1	2
	27	(Sale Volume)^2	1	3	4
	23	Contract Period	7	0	7
	20	Road Costs	1	4	5

Group A - Firm Characteristics
Group B - Market Conditions
Group C - Noncontrollable Timber Sale Characteristics
Group D - Controllable Timber Sale Characteristics

1/ These numbers are the same as the variable numbers in Table 8.

Variable	Description	Logic
1. Bid Ratio	Dependent variable. Mean bid price/mean appraised price, both weighted by species volume.	As a measure of the degree of competition
2. Operator Type	Each purchaser coded as to his processing potential. 1 = Logger 2 = Sawmill 3 = Plywood/Veneer 4 = Sawmill and Plywood 5 = Integrated - all of the foregoing plus a special product (pulp, fiberboard, etc.)	To check for a correlation between processing facilities and the degree of competition. A positive relationship would be expected, i.e., an integrated operator could better utilize timber and therefore afford to pay more. A negative correlation may indicate market power.
3. Timber Dependency Status	Codes: 1 = Purchaser owns timber supply equal to or greater than five times his yearly mill capacity 2 = Less than in 1	A purchaser who is not highly dependent upon an outside timber supply can afford to choose the less competitive sales. Positive correlation expected.
4. Operator Size	The daily mill or logging capacity of the purchaser. The square of this variable was also tested.	Mead found that larger purchasers paid less for timber than smaller purchasers.
5. Number of Active Bidders	Self explanatory.	The more active bidders, the higher the bid ratio.
6. Number of Qualifiers	Self explanatory.	Same as 5 above.
7. Number of Potential Bidders	Estimated number of potential bidders by Forest Management Area	Same as 5 above.

	Variable	Description	Logic
8.	Distance to Appraisal Point	Distance in miles as estimated by appraisal.	Negative correlation - sales nearer to utilization centers should have higher competition.
9.	Distance to Purchaser's Mill	Distance in miles.	Same as 8 above.
10.	Ratio: $\frac{\text{Variable 8}}{\text{Variable 9}}$	Ratio	Positive relationship.
11.	Diversity of Market	Each appraisal point coded as to the facilities available: 1 = Lumber only 2 = Plywood/Veneer only 3 = Lumber, Plywood and Veneer 4 = Integrated.	Positive correlation expected. Purchasers nearer more diversified facilities could afford to bid more.
12.	Capacity Ratio	An index of the ratio of total daily milling capacity to total standing saw timber volume by county.	To indicate supply-demand relationships. Positive correlation expected.
13.	Market Level	Monthly index of Douglas fir lumber prices.	To indicate the relationship of market conditions to competition. Positive relationship expected.
14.	Housing Starts	Based on a monthly estimation of annual rates.	Same as 13 above.
15.	Month of Sale	Months coded 1 to 12, January = 1. The square of this variable was also included to check for a curvelinear relationship.	To see if the level of competition is correlated with the time of year. Negative relationship expected.

	Variable	Description	Logic
16.	Percent Salvage	The net volume of salvage divided by the total net volume of the sale.	More salvage volume could indicate higher risk, or difficult logging. Negative relationship expected.
17.	Species	The net volume of Douglas fir and/or pine divided by the total net volume of the sale.	To indicate the effect of minor species. Relationship could be positive or negative depending upon the market or facilities for manufacturing minor species.
18.	Percent Recovery	The total net volume divided by the total gross volume based upon the cruise estimate.	A lower percent recovery would indicate more risk. A positive correlation would be expected.
19.	Pond Value	The average log value at the mill weighted by volume for all species.	An indication of timber quality. Positive relationship expected.
20.	Stump to Truck Costs	Logging costs, exclusive of hauling per MBF.	To indicate the difficulty of logging the sale. Negative correlation expected.
21.	Stumpage Price	Appraised price per MBF.	An indication of the net value of the stumpage. Positive relationship expected.
22.	Road Use Costs	The road use fee plus the maintenance allowance per MBF as estimated by the appraisal.	To indicate the cost of using access. Positive correlation expected.
23.	Contract Period	Time allotted for contract in years.	If time allotted is too short, the relationship should be positive.
24.	Sale Volume	Volume rounded to nearest 10 MBF volume squared was also included.	Mead found an inverse relationship here.

Variable	Description	Logic
25. Road Costs	Construction and improvement cost/ MBF as estimated by the appraisal.	To check the hypothesis that high road construction requirements are a barrier to competition.

VARIABLE MEANS BY FOREST MANAGEMENT AREAS

District	Forest Management Area	Operation Type	Ownership Status	No. Active Bidders	No. of Qualifiers	No. Potential Bidders	Dist. to Upper Point	Dist. to Purch. Mill	Mkt. Div. at Upper Pt.	Operator Size	Capacity Ratio	Market Level	Housing Starts	Month of Year	Volume of Sale	% of Salvage	# of Species	% of Recovery	Road Value	Road Costs	Logging Costs	Access Limitations	Contract Period	Stumpage Price	Ave. Bid Mat. (Dep.)	Forest Management Area	No. of Observations
Salem	Columbia	2.5	1.8	2.2	3.5	17.0	18.8	24.5	2.1	225	32	103	13.3	6.2	2.02	.20	.84	.80	82	3.86	13.57	0.70	2.1	18.58	1.31	11	77
	Molalla	2.8	1.7	2.4	3.4	11.4	23.8	32.9	1.0	225	6	101	13.5	7.2	2.43	.35	.85	.77	89	3.00	11.67	1.89	1.9	17.31	1.46	12	28
	Alsea	1.5	1.5	1.7	2.7	16.4	26.1	21.9	2.9	138	16	102	13.1	6.9	1.88	.49	.88	.72	64	2.08	11.02	0.63	1.6	20.58	1.02	13	73
	Rickreall	3.0	1.3	1.7	2.7	13.4	23.0	24.9	2.1	396	20	101	13.5	7.2	3.07	.33	.82	.69	63	2.21	10.78	1.84	2.2	19.78	1.40	14	37
	Crabtree	3.1	1.2	1.9	2.2	11.8	23.9	26.3	3.0	396	8	102	13.1	6.9	4.45	.49	.62	.71	58	2.89	10.60	1.49	2.2	18.27	1.21	15	47
	North Santiam	2.2	1.7	2.3	2.8	14.8	16.6	18.1	1.7	131	9	102	12.6	7.0	0.82	.50	.90	.78	64	0.29	11.82	0.36	1.2	23.50	1.53	16	17
TS Medford	Galice	1.3	2.0	1.8	2.3	50.0	26.5	30.8	3.0	101	8	103	13.1	6.9	2.64	.34	.94	.77	66	3.09	11.95	1.12	1.9	21.73	1.13	51	95
	Glendale	2.6	2.0	1.8	2.1	45.0	23.7	26.3	3.0	189	5	103	12.8	7.0	2.69	.40	.97	.75	67	2.52	11.12	1.01	1.5	22.47	1.12	52	96
	Applegate	2.0	2.0	1.8	2.8	56.0	25.4	24.7	3.6	116	8	103	12.9	6.4	2.37	.30	.94	.78	66	4.37	11.72	0.45	2.1	21.84	1.19	53	98
	Trail	2.7	1.4	1.6	2.1	51.0	30.3	36.2	3.4	302	7	103	12.9	6.5	2.85	.24	.88	.77	64	3.15	10.57	0.81	2.0	21.52	1.13	54	102
	Greensprings	2.8	1.9	2.0	2.6	38.0	25.1	32.8	2.2	288	7	103	13.1	6.7	3.25	.11	.50	.73	61	3.10	10.22	0.70	2.5	15.52	1.26	55	67
Roseburg	Drain	3.0	2.0	1.8	2.4	20.8	15.7	17.4	2.3	230	4	102	12.9	6.4	2.25	.52	.92	.67	63	2.98	11.98	0.72	1.4	21.63	1.19	31	129
	Dillard	2.3	1.6	1.8	2.9	28.1	17.9	22.5	2.3	311	4	103	13.2	6.5	2.35	.41	.89	.71	62	2.29	13.31	0.62	1.7	20.67	1.13	32	65
	North Umpqua	2.3	1.8	2.0	3.5	17.1	23.0	29.9	2.5	166	4	103	13.9	6.4	2.22	.64	.87	.73	69	2.18	12.09	0.99	1.1	21.19	1.17	33	114
	South Umpqua	1.9	2.0	1.6	3.4	24.0	19.3	23.4	1.2	150	4	102	13.1	6.4	2.91	.47	.93	.72	64	3.94	14.29	0.82	1.8	20.12	1.11	34	51
Eugene	Siuslaw	1.5	1.6	2.1	4.0	30.5	18.6	8.6	1.2	103	8	102	14.6	6.5	1.40	.66	.94	.89	63	1.21	9.31	0.81	1.1	23.20	1.28	21	75
	Triangle Lake	3.0	1.5	1.8	3.1	18.7	24.7	19.6	2.6	133	8	102	13.8	6.0	1.78	.51	.93	.89	52	1.13	9.22	0.53	1.5	22.65	1.29	22	36
	Mohawk	1.9	1.8	2.4	5.9	25.4	18.5	11.5	2.5	133	8	102	13.3	7.0	2.46	.62	.96	.88	65	2.19	9.15	0.82	1.5	23.79	1.48	23	46
	Willamette-McKenzie	1.8	1.8	2.2	4.5	49.7	17.4	10.5	1.8	129	8	103	13.3	6.7	1.63	.66	.87	.88	65	1.47	10.40	0.78	1.0	23.17	1.36	24	81
Coos Bay	Coquille	2.9	1.8	2.0	3.2	30.0	24.8	31.3	2.7	377	9	102	12.7	6.2	4.85	.42	.82	.69	62	4.00	9.50	0.56	1.8	20.32	1.27	41	78
	Lower Umpqua	2.2	1.8	2.1	3.5	30.6	32.0	37.4	3.8	190	4	102	13.3	6.6	3.00	.45	.91	.72	63	2.70	10.58	0.27	1.7	20.54	1.26	42	92
	Myrtle Point	2.0	2.0	2.0	3.2	20.0	22.0	26.1	2.0	218	9	102	12.8	7.2	2.54	.38	.88	.71	62	4.48	10.88	0.04	1.4	20.15	1.33	43	40
	Curry	2.5	1.9	1.9	2.4	17.0	18.1	26.4	2.7	245	5	103	12.8	7.3	2.37	.23	.93	.74	66	4.63	11.63	0.84	1.7	20.98	1.41	44	11
	ALL BLM DATA	2.4	1.8	1.9	3.1	32.2	23.3	25.0	2.5	207	8	103	13.2	6.6	2.56	.43	.87	.76	63	2.81	11.22	0.79	1.7	20.98	1.25		

ATTACHMENT 11

This appendix is intended to more thoroughly explain the way in which Multiple Regression and Discriminant Function Analysis were applied to the study.

MULTIPLE REGRESSION

The "Stepwise" approach to regression analysis was used on all runs. This approach allows independent variables to enter the function one at a time, starting with the most significant and progressing until a specified minimum level of significance is reached. All variables not satisfying this minimum level are eliminated.

For this study the minimum levels of significance for entry and removal were set at values that would permit the entry of many variables. This was done to provide a more thorough examination of the variables. Then, the function was selected for further analysis that contained variables with an "F to Remove" that satisfied at least the 90 percent probability level (based upon the "F" distribution).

While the ordinary "F" statistic found for testing significance in conjunction with stepwise regression procedures is known to have some bias, making reliability of significance as indicated questionable, it is felt that the results are quite meaningful and can provide insight into the timber sale bidding situation.

DISCRIMINANT FUNCTION ANALYSIS

In this kind of an analysis, a linear function of an appropriate set of variables is developed in such a way that individual cases can be classified most effectively into distinct groups. Based upon the individual measurements of pertinent variables in each case, a coefficient is developed for each variable whereby a linear function, the one which best discriminates the groups, can be determined.[1/] The value of such a function is then worked out for each group (competitive and non-competitive in this study) using the variable means. In theory then, the quantities of each variable for a sale or case would be inserted in the equation and the linear function determined for that case. It would be classified in the competitive or non-competitive group depending upon the group function, as developed through use of variable means in each group, to which it fell closest. Using the "Students t" distribution the probability of a misclassification can be determined. Following is an example of the procedure:

MOLALLA FOREST MANAGEMENT AREA

Z = Discriminant function

X_{14} = Percent salvage (net volume to gross volume ratio)
X_{18} = Logging costs

General function

$$Z = 1.40986 - .43908X_{14} - .04942X_{18}$$

1/ The coefficients are developed in such a way that the ratio of the difference between specific variable means of the classes to the standard deviations within classes is maximized.

Competitive sales

Mean X_{14} = .24474
Mean X_{18} = 10.78947

Discriminant function for competitive sales =

$Z_1 = 1.40986 - (.43988)(.24474) - (.04942)(10.78947) = .76898$

Non-competitive sales

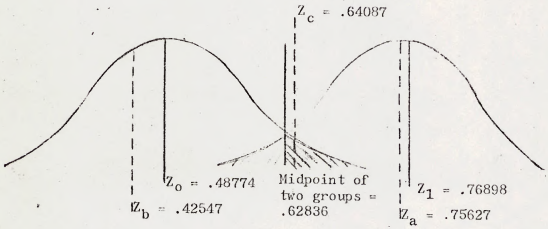
Mean X_{14} = .57333
Mean X_{18} = 13.55555

Discriminant function for non-competitive sales =

$Z_o = 1.40986 - (.43988)(.57333) - (.04942)(13.55555) = .48774$

Case	Percent Salvage	Stump to Truck Cost
a	.25	$11.00
b	.55	13.00
c	.40	12.00

$Z_a = 1.40986 - .43988(.25) - .04942(11) = .75627$
$Z_b = 1.40986 - .43988(.55) - .04942(13) = .42547$
$Z_c = 1.40986 - .43988(.40) - .04942(12) = .64087$



Z_a is nearest the function for competitive sales and is so classified.
Z_b is nearest the function for non-competitive sales and is so classified.
Z_c is nearest the function for competitive sales, but there is a good chance for misclassification as the diagram indicates.

Using the regression technique the probability of a misclassification can be determined as follows:

$$\text{"t"} = \left| \frac{X_1 - X_0}{2} \right| \sqrt{\frac{(\text{Deg. Frdm.})(\text{Total sums of squares})}{\left(\begin{matrix}\text{Squares Acc't. for} \\ \text{by Regression}\end{matrix}\right)(\text{Residual Squares})}} = .63265$$

y = Probability for "t" of .632 = .52

.5y = Probability for misclassification = .26

There is some analogy between this analysis and a regression analysis. By assuming zero as the value for the dependent variable in one group for each observation and one as the value of the dependent variable for each observation in the other group, a multiple regression analysis can be used giving desired results. This is explained by R. A. Fisher and was a particularly valuable technique in this case as it permitted use of a stepwise regression computer program whereby variables could be screened and only the most discriminating used in developing the function. Only those with an "F" value indicating significance at the 90 percent probability level were included in the development of the discriminant function and final determination of misclassification probability. The same comment with respect to reliability of the indicated significance level that is mentioned in the Multiple Regression is pertinent here.

PURCHASERS WHO BOUGHT 25 PERCENT OR MORE OF BUREAU OF LAND MANAGEMENT SALES RESULTING FROM A ONE BID OR A TOKEN BID 1/

APPENDIX IV

Menasha Corporation
L B & L Logging
Ralph Johnson Lumber Co.
Woolley Logging Co.
Martin Bros. Containder & Timber Products Corp.
Layton Logging Co.
Mathews
International Paper Co.
Huffman Logging
Independent Loggers and Contractors
Collier Lumber Co.
South Coast Lumber Co.
Standard Veneer
Georgia Pacific Corporation
Elkside Lumber Co.
Ben Henderson Logging
Loran Loresque
Gibson & Son
Salberg Bros.
H. A. Gould
Lloyd T. Keeland
M. C. Haskell
Waterman Logging
Willamette Valley Lbr. Co.
Simpson Timber
Boise Cascade Corporation
Alsea Lumber Co.
Grimm
Kessie
Paul Barber Hardwoods
Culley & Morgan
Hull-Oaks Lumber Co.
Willamina Lumber Company
Avison Lumber Co.
Publisher's Paper Co.
Hobin Lumber Co.
McKay
Diamond Lumber Co.
Lulay Brothers Lumber Co.
McDonough Logging
Spar Tree Logging
Elmer Parker
Garrabrant Lumber Co.
Guy Roberts
Fort Hill Lumber Co.
Roy Bird
Oregon Alder-Maple Co.
Bethel Vernon
T. J. Starker
F. G. Bennett
Alder Creek Lumber Co., Inc.
Rudy Lumber Co.
Sweet Home Veneer, Inc.
Myron Pursley
Zahon Lumber Co.
Fern Ridge Lumber Co.
Lobsten Logging Co.
J. A. Peterson
R. T. Boggs Lbr.
John Buche
Aaron Bros.
Pedee Lumber Co.
Dale S. Coop
Ray Marshall Logging
Morrell Logging Co.
K & K Lumber Co.
Hult Lumber and Plywood Co.
Mosley Creek Lumber Co.
John G. Shelley
Schneider Lumber Co.
Thatcher Forest Products
Sweet Home Veneer, Inc.
Olsen & Sons
Swanson Bros. Logging Co.
R. M. Jorgenson
Murphy Logging Co.
Bohemia Lumber Co., Inc.
Keeney
Cline & Ladd
McDougal
Don Kennedy
Snellstrom Logging Co.
Wilkins
Ralph Johnson Lumber Co.
Barker Timber Co., Inc.
Orme Lumber Corporation

Neuman Logging
Capital Lumber Co.
Shadden Lumber Co.
Davis Logging Co.
Defoe Logging
Eugene Aldrich
Kooze Bros.
W. E. Cox
W. E. Haggerty
Bauman Lumber Co.
Rickini Lumber Co., Inc.
Leonard Bloom
Lou A. Surcamp
C. Bradley Logging Co.
Savelich Logging Co.
W & J Logging Co.
D & M Lumber
Thomas Wright
R. B. Edmonds
Beckley Lbr.
Don Roth
C. W. Schrock
Barnett Logging
U. S. Plywood Corporation
Wharton & Sorenson
Sun Studs, Inc.
Elwin DeGrath
Roseburg Lumber Company
C & D Lumber Co.
D. R. Johnson
M. A. Rantz
L & H Lumber Co.
Ben R. Harris
E. L. Paris Logging Co.
M. J. Perini
Bellortha
Lumber Sales, Inc.
John Nielson
Ken Claude
Round Prairie Lumber Co.
M & M Logging Company
M. E. Agee
Fred Fitzgerald
Grant Madison
Schattenkirk Logging
William Kenwisher
Grant H. Nelson
Einar Julius Engin

Purdy Bros. Log. Co.
Larson
Conleys & Lawson
Eugene Veneer
Loyd F. Silva
Hoot Owl Logging Co.
Medco
Kogap Manufacturing Corporation
Spaulding & Son, Inc.
Brown Bros. Logging
Double Dee Lbr. Co., Inc.
Cabax Mills
Southern Oregon Plywood, Inc.
Rough & Ready Lumber Co.
Pierre Biencourt
Pieren & Kruesi
Addie B. Hisau
Wesley Pieren
Bate Plywood Co., Inc.
The Robert Dollar Co.
Elk Lumber Company
Superior Lumber Co.
Stumbo Bros.
Priebs
Glendale Studs
Cheney Forest Products, Inc.
Estramada & Sons
Timber Products Co.
S & W Logging
Steve Wilson Lbr. Co.
Willey Jones
Munday
Lindsay Lumber Co.
S H & W Lumber
Ralph Fisher
R. Tyke
K & C Timber
Caveman Lumber Company
Eugene Lawson
T. J. Parker
McIntire
Haskett Logging
Conrad Carpenter
Wells Logging Co.
D. R. Burton
E. W. Cushman
Trail Creek Logging Co.
Bill Gallentine

Forest Industries
Zeigler & Hanley
A. Muetzel & Bros.
Wilbur White
Russeks Incorporated
F. W. Hancock
1106 Corp.
W & S Logging
Pugh Logging
Parker Industries
Kent Brady
Schmidt & Crews Logging Co.
Yost Logging
W. H. Kohl
P. Zimmerman
Lowell Jones
Regona, Button & Cole

1/ Because all sales were not included in this analysis, it was not possible to determine exactly which firms purchased 25% or more of their timber in one-bid/token bid sales. The assumption was made that a firm having at least 50% of its sales in the one-bid/token bid category for this study would fall into the 25% classification. This assumption was based upon the proportion of sales sampled.

PURCHASERS WHO BOUGHT ABOUT 75 PERCENT OF THE TOTAL ONE-BID OR TOKEN-BID BUREAU OF LAND MANAGEMENT SALES DURING THE 5 YEAR STUDY PERIOD

(List is ranked by number of sales purchased)

Woolley Logging Co.
Willamette Valley Lbr. Co.
The Robert Dollar Co.
Medco
U. S. Plywood Corporation
Kogap Manufacturing Corporation
Roseburg Lumber Company
Coos Head Timber Co.
Spaulding & Son, Inc.
C & D Lumber Co.
Timber Products Co.
Douglas Fir Plywood Company
Southern Oregon Plywood, Inc.
Hult Lumber and Plywood Co.
Menasha Corporation
Culley & Morgan
Bate Plywood Co., Inc.
Brown Bros. Logging
Douglas County Lumber Co.
Martin Bros. Container & Timber Products Corp.
Cabax Mills
Elk Lumber Company
Mt. Baldy Logging
Elkside Lumber Co.
Simpson Timber
Schneider Lumber Co.
Sun Studs, Inc.
Steve Wilson Lbr. Co.
Chency Forest Products, Inc.
International Paper Co.
Rex Clemens
Swanson Bros. Logging Co.
Murphy Logging Co.
Crater Plywood
Superior Lumber Co.
L & H Lumber Co.
D & F Logging
Boise Cascade Corporation
Hull Oaks Lumber Co.
Lulay Brothers Lumber Co.
Morrell Logging Co.
Green Valley Lumber, Inc.
Double Dee Lbr. Co., Inc.
Wesley Pieren
Lumber Sales, Inc.
Layton Logging Co.
Grimm
Spar Tree Logging
Alder Creek Lumber Co., Inc.
Sweet Home Veneer, Inc.
Giustina Bros. Lbr. & Ply. Co.
Evans Products Co.
S H & W Lumber
K & C Timber
Caveman Lumber Company
Kent Brady
Pieren & Kruesi
Ralph Johnson Lumber Co.
Moore Mill & Lbr. Co.
Ben Henderson Logging
Alsea Lumber Co.
Willamina Lumber Company
Tillamook Veneer Co.
Timber Access Industries Co.
F. G. Bennett
Barker Willamette Lumber Co.
Purdy Bros. Log. Co.
Eugene Veneer
Eugene Aldrich
Wharton & Sorenson
Munday
Pierre Biencourt
Glendale Studs
D. R. Johnson Lumber Co.
E. L. Paris Logging Co.
M. J. Perini
Round Prairie Lumber Co.
Grant H. Nelson

PURCHASERS WHO BOUGHT ABOUT 75 PERCENT OF THE TOTAL ONE-BID OR TOKEN-BID BUREAU OF LAND MANAGEMENT SALES DURING 1962

(List is ranked by number of sales purchased)

Woolley Logging Co.
Willamette Valley Lbr. Co.
The Robert Dollar Co.
Douglas Fir Plywood Company
U. S. Plywood Corporation
Caveman Lumber Company
Spaulding & Son, Inc.
Mountain Fir Lumber Company
Bate Plywood Co., Inc.
Timber Products Company
Roseburg Lumber Company
C & D Lumber Co.
Menasha Corporation
Martin Bros. Container & Timber Products Corp.
Coos Head Timber Co.
Layton Logging Co.
Tillamook Veneer Co.
Lulay Brothers Lumber Co.
Hult Lumber and Plywood Co.
Schneider Lumber Co.
Eugene Veneer
Sun Studs, Inc.
Steve Wilson Lbr. Co.
S H & W Lumber
K & C Timber
Medco
Cabax Mills
L & H Lumber Co.
Stomor Lbr. Co.
A. Muetzel & Bros.

PURCHASERS WHO BOUGHT ABOUT 75 PERCENT OF THE TOTAL ONE-BID OR TOKEN-BID BUREAU OF LAND MANAGEMENT SALES DURING 1963

(List is ranked by number of sales purchased)

Woolley Logging Co.
Willamette Valley Lbr. Co.
Hult Lumber and Plywood Co.
U. S. Plywood Corporation
Douglas Fir Plywood Company
Elkside Lumber Co.
Murphy Logging Co.
International Paper Co.
Rex Clemens
Timber Products Company
D & F Logging
Mt. Baldy Logging
Douglas County Lumber Co.
Martin Bros. Container & Timber Products Corp.
Simpson Timber
Culley & Morgan
Alder Creek Lumber Co., Inc.
Sweet Home Veneer, Inc.
Schneider Lumber Co.
Medco
Lumber Sales, Inc.
Menasha Corporation
Ben Henderson Logging
Boise Cascade Corporation
Timber Access Industries Co.
Swanson Bros. Logging Co.
Spaulding & Son, Inc.
Southern Oregon Plywood, Inc.
C & D Lumber Co.
Grant H. Nelson
Moore Mill & Lbr Co.
Huffmsn Logging
Mitchell Bros Logging Co.
Independent Loggers and Contractors
Grimm
Spar Tree Logging
E. G. Bennett
Morrell Logging Co.
Giustina Bros. Lbr. & Ply Co.
Barker Willamette Lumber Co.
Cline & Ladd
Snellstrom Logging Co.
Ralph Johnson Lumber Co.
Leonard Bloom
W & J Logging Co.
Steve Wilson Lbr. Co.
S H & W Lumber
Bill Gallentine
Kogap Manufacturing Corporation
Cabax Mills
Bate Plywood Co., Inc.
Roseburg Lumber Co.
E. L. Paris Logging Co.
John Nielson
Round Prairie Lumber Co.
A. C. Koch
Regona, Button & Cole

PURCHASERS WHO BOUGHT ABOUT 75 PERCENT OF THE TOTAL ONE-BID OR TOKEN-BID BUREAU OF LAND MANAGEMENT SALES DURING 1964

(List is ranked by number of sales purchased)

Woolley Logging Co.
Kogap Manufacturing Corporation
The Robert Dollar Co.
Spaulding & Son, Inc.
U. S. Plywood Corporation
Willamette Valley Lbr. Co.
Morrell Logging Co.
Sun Studs, Inc.
Medco
Crater Plywood
Superior Lumber Co.
C & D Lumber Co.
Layton Logging Co.
Kessie
Willamina Lumber Company
K & K Lumber Co.
Purdy Bros. Log. Co.
Evans Products Co.
Kent Brady
Brown Bros. Logging
Double Dee Lbr. Co., Inc.
Southern Oregon Plywood, Inc.
Pieren & Kruesi
Bate Plywood Co., Inc.
Timber Products Co.
Roseburg Lumber Company
Lowell Jones

PURCHASERS WHO BOUGHT ABOUT 75 PERCENT OF THE TOTAL ONE-BID OR TOKEN-BID BUREAU OF LAND MANAGEMENT SALES DURING 1965

(List is ranked by number of sales purchased)

The Robert Dollar Co.
Roseburg Lumber Company
Southern Oregon Plywood, Inc.
Coos Head Timber Co.
Medco
C & D Lumber Co.
Martin Bros. Container & Timber Products Corp.
Wharton & Sorenson
Sun Studs, Inc.
Willey Jones
Spaulding & Son, Inc.
Double Dee Lbr. Co., Inc.
Cabax Mills
Wesley Pieren
Elk Lumber Company
Cheney Forest Products, Inc.
Timber Products Co.
Magness & Marchall Logging
Kogap Manufacturing Corporation

PURCHASERS WHO BOUGHT ABOUT 75 PERCENT OF THE TOTAL ONE-BID OR TOKEN-BID BUREAU OF LAND MANAGEMENT SALES DURING 1966

(List is ranked by number of sales purchased)

Medco
Woolley Logging Co.
Brown Bros. Logging
Culley & Morgan
Kogap Manufacturing Corporation
Elk Lumber Company
Menasha Corporation
Coos Head Timber Company
Willamette Valley Lbr. Co.
Eugene Aldrich
Roseburg Lumber Company
L & H Lumber Co.
Martin Bros. Container & Timber Products Corp.
Simpson Timber
Hull-Oaks Lumber Co.
Publisher's Paper Co.
T. P. Miller Lumber Co.
Lulay Brothers Lumber Co.
Mosley Creek Lumber Co.
Douglas County Lumber Co.
Douglas Fir Plywood Company
Kooze Bros.
W. E. Haggerty
Steve Wilson Lbr. Co.
Munday
Ralph Fisher
Cabax Mills
Southern Oregon Plywood, Inc.
Pieren & Kruesi
Crater Plywood
Wesley Pieren
Bate Plywood Co., Inc.
The Robert Dollar Co.
Cheney Forest Products, Inc.
Timber Products Co.
C & D Lumber Co.

AN EXAMPLE - INDIVIDUAL FOREST MANAGEMENT AREA ANALYSIS

This appendix describes how the results of foregoing analysis could be interpreted for the individual Forest Management Area. It should be emphasized that an intimate knowledge of local conditions is required if the interpretation is to be meaningful. This point is illustrated by the following example.

GLENDALE

Mean Bid Ratio - 1.12

Variables significant to the degree of competition:

1. Month of Sale (Most important) -
2. Distance to Purchaser's Mill +
3. Sale Volume -
4. Sale Volume Squared +

Variable significant to the class of competition:

1. Month of Sale -
2. Distance to Purchaser's Mill +
3. Percent of Salvage Volume +

It was shown that the "Month of Sale" is important to both the degree and class of competition with a negative relationship. The "Bid Ratio" decreases and the probability of a one-bid sale increases as the month of sale progresses chronologically from January. The elevation and climate of the Glendale Forest Management Area is such that much of the area is covered with snow for a considerable part of the winter.

The snow is usually sufficient to prohibit any type of logging operation. If a firm purchases a timber sale in the latter part of the year, there is a good chance that it will not be able to log it until spring. The BLM requires a down payment on a sale of approximately 10 percent of the total purchase price in addition to a performance bond at the time that the contract is approved. Thus, the firm cannot realize any return on this investment for several months. This is one of several factors which could be responsible for the observed relationship.

At first glance the positive relationship of the "Distance to the Purchaser's Mill" seems somewhat illogical. Here again, an intimate knowledge of the area provides a key. A large, integrated firm is located very close to the Glendale Forest Management Area. This firm has lands and roads intertwined with those of the BLM. Thus, this large integrated firm has a tremendous competitive advantage over other firms, especially those outside the area. If this large firm does not bid on a sale in the area, other less strategically located firms may be more optimistic about their chances to get the sale and competition is more intense.

The "Sale Volume" (-) and "Sale Volume Squared" (+) were related to the degree of competition only. They were not significant in discriminating between the one-bid/multi-bid categories. The relationship is such that the "Bid Ratio" is decreasing with an increase in sale size until approximately 4400 MBF is reached. Then

the "Bid Ratio" takes an upward trend with increased size. Perhaps this relationship can also be explained by the nature of the industry in the area. The large, strategically located firm has lower fixed costs on sales in this area because its equipment and manpower are close at hand. As sale size increases, however, this advantage is diminished; i.e., some fixed costs are spread over a greater volume and the sale becomes more attractive to outsiders.

The positive relationship of "Percent Salvage" to the probability of a multi-bid is perhaps the most difficult to understand. One can speculate that sales with larger volume of salvage have some characteristic that makes them more valuable to firms in the area. The nature of this characteristic is not readily apparent and further information and study would be required to find the relationship.

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